DT FAQS

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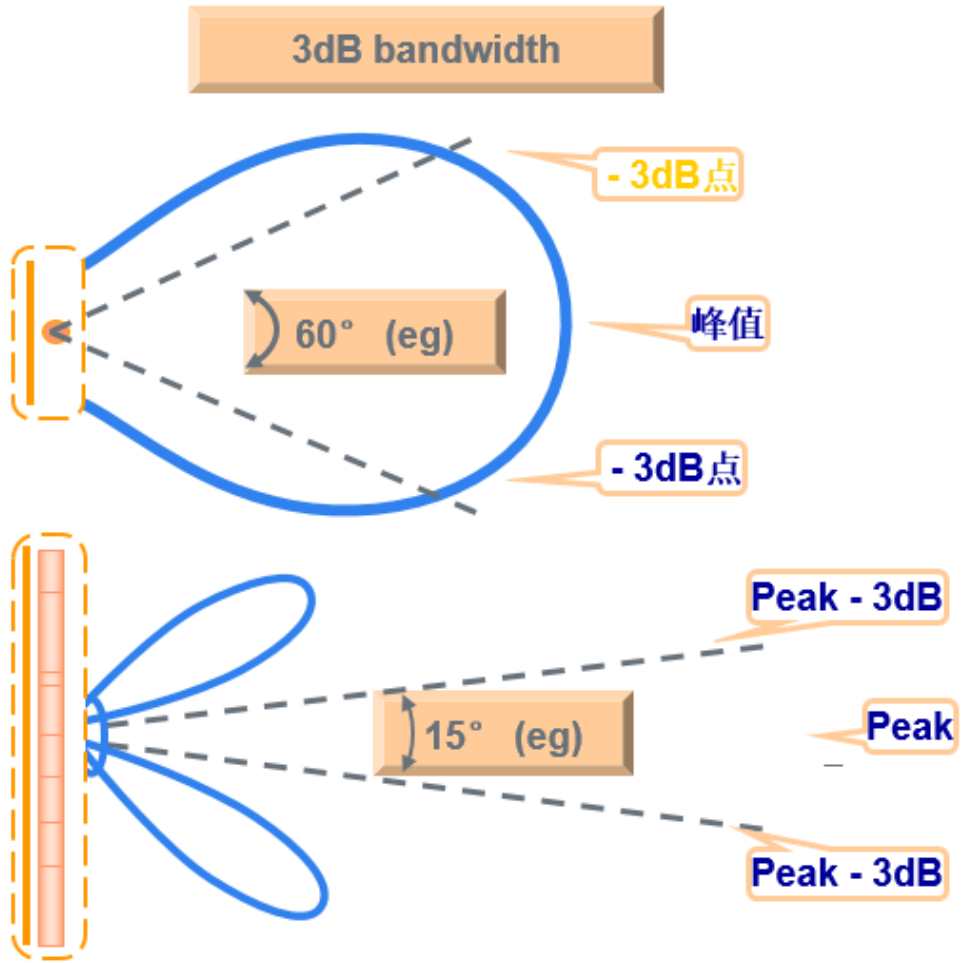
Contents

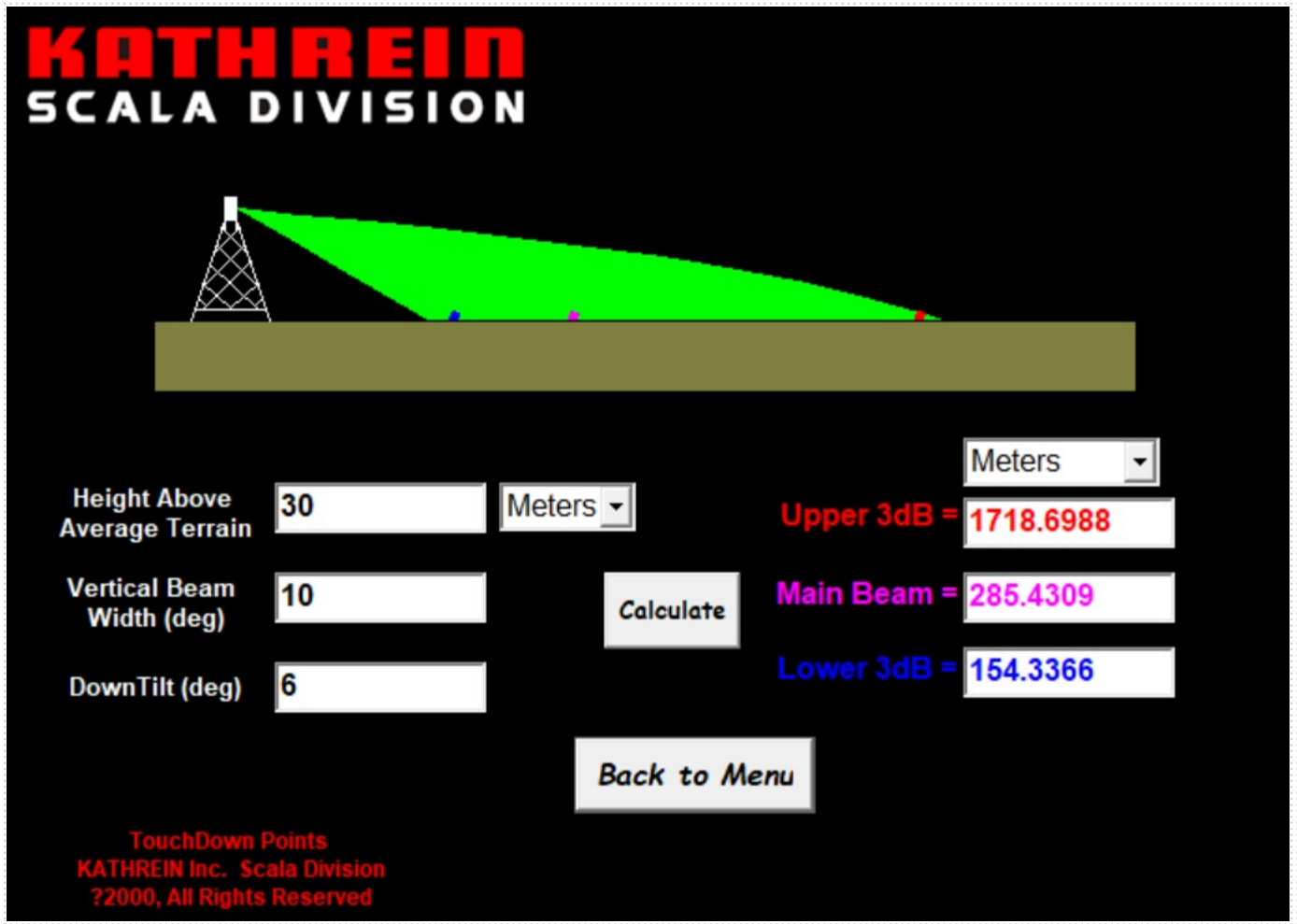
LTE DT FAQS

Problem Category	Subcategory	Problem Description	Solution
Coverage problems	Poor coverage	The RSRP of LTE signals on a road is less than -110(-105) and lasts for a certain distance.	1. Optimize the RF (downtilt angle). 2. Increase the cell transmit power. 3. Replace high-gain antennas. 4. Add new sites.
	Overshoot coverage	The RSRP of the cell signal of site A is continuously greater than that of site B within the main coverage area of BTS B.	1. RF optimization 2. Decrease the cell transmit power 3. Decrease the antenna height.
Interference problems	Intra-frequency interference(Overlapping coverage)	Two or more intra-frequency LTE signals with the same strength are generated on a road section. The larger the number of interference signals, the smaller the difference in strength, and the more severe the interference	Select a primary coverage cell to enhance the signal strength of the primary coverage cell and reduce the interference signal strength.
	Mod 3 interference	The strength of the serving cell is the same as that of the neighboring cell, and the PCI mod3 of the serving cell is the same as that of the neighboring cell.	1. Change the signal strength of the serving cell or neighboring cell through RF optimization. 2. Change the PCI of the serving cell or neighboring cell.
Ho-problems	Ho failure or not ho	Missing neighboring cells, incorrect external cell definition, or improper parameters	Add neighbor relationships and modify external cells or handover parameters.
Alms	All kinds of alms	Hardware fault, VSWR,out-of-synchronization	Troubleshooting and Clearing Alarms

Contents

Conventional antenna coverage diagram

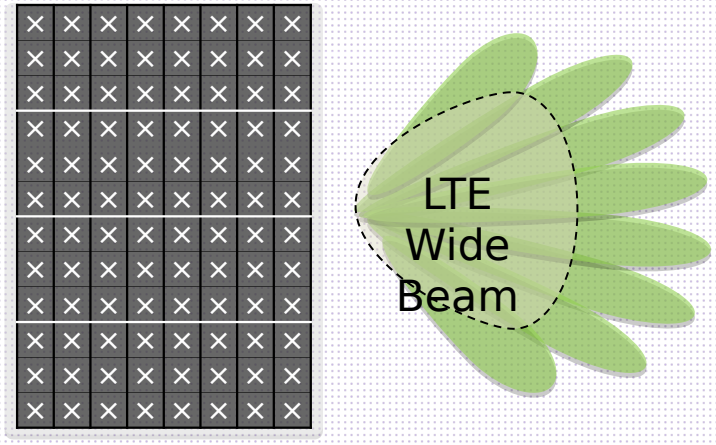




5G Massive MIMO Narrow Beam

5G NR narrow beam

64T64R/32T32R

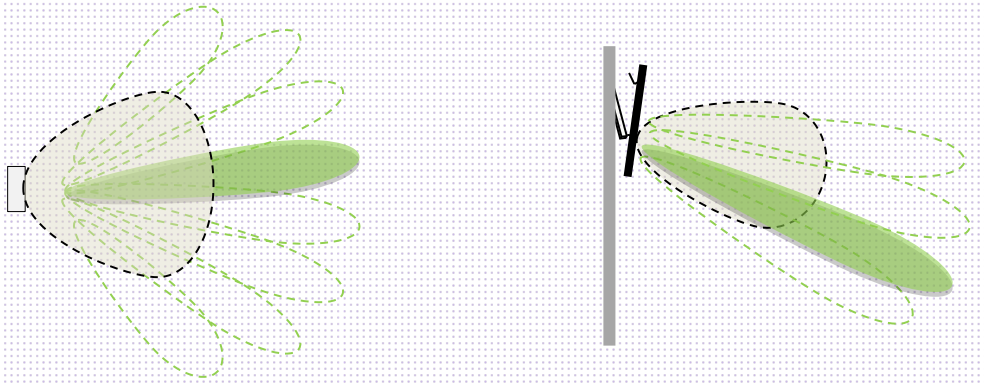


- Multi-pole realize beamforming
- Coverage improved by BCH, SCH, CSI-RS channels beamforming

5G NR narrow beam improves H+V coverage

Horizontal beam

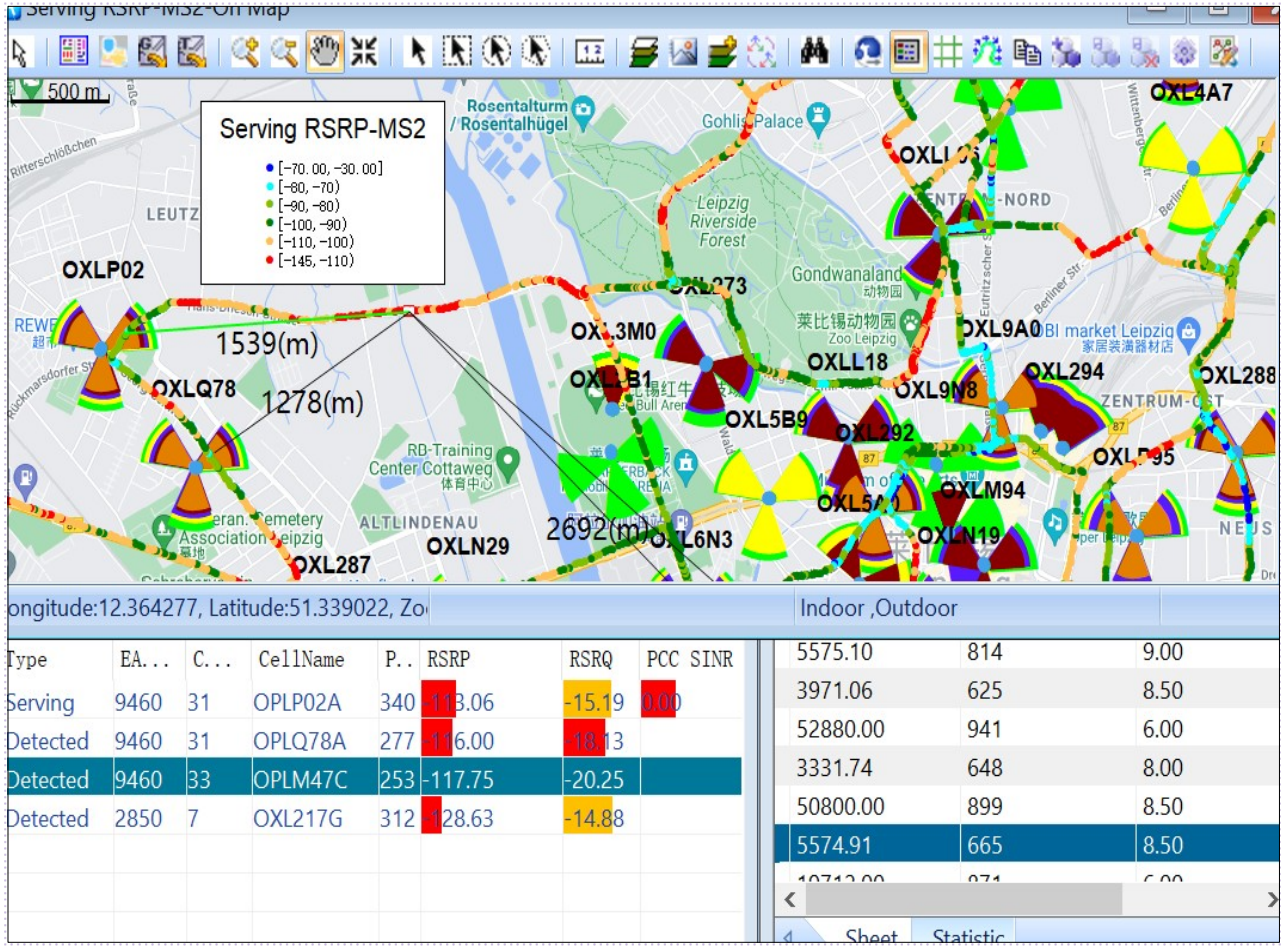
Vertical beam



- NR beamforming is more accurate
- Better SINR, decrease interference

Poor Coverage Scenario

Case1:poor coverage due to excessive inter-site distance



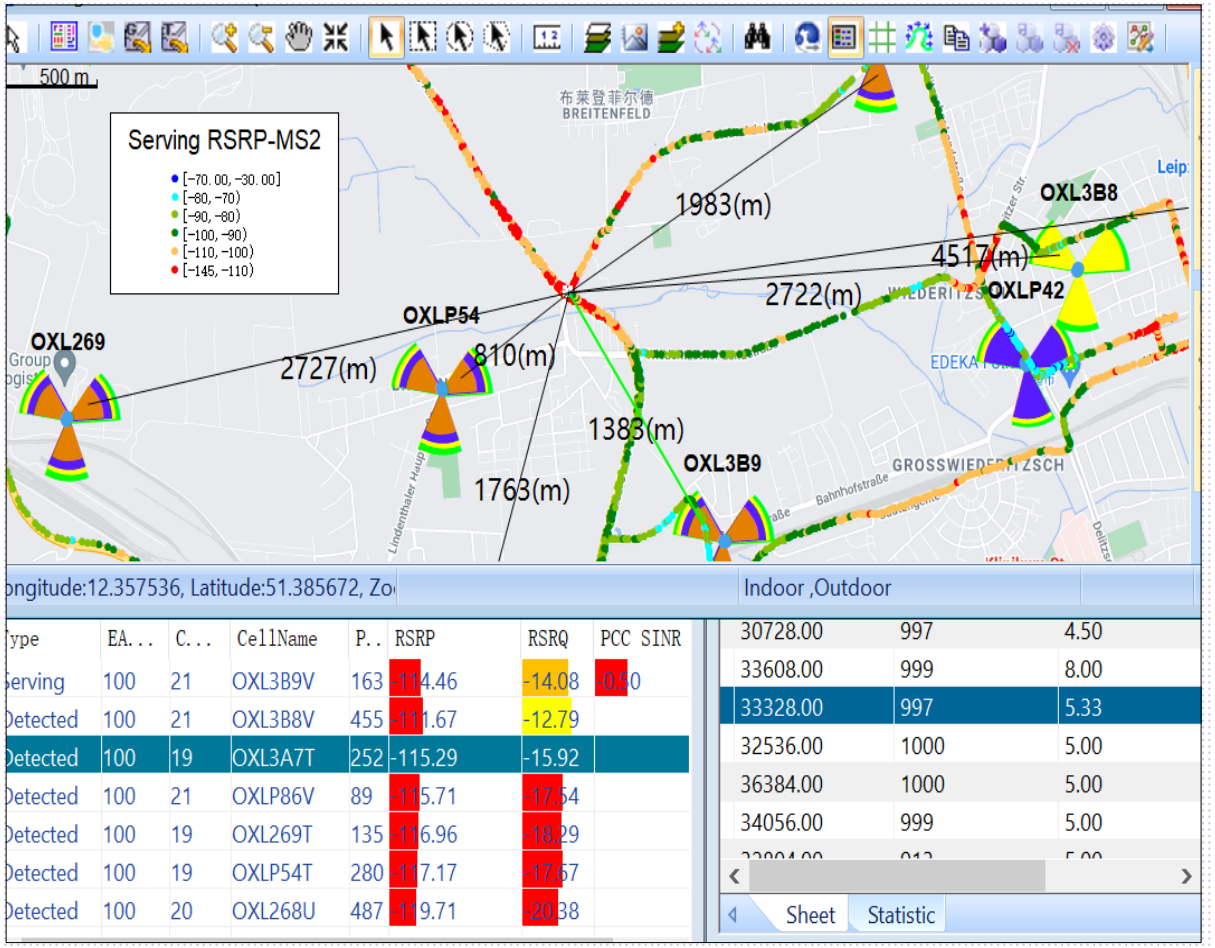
Type	EA...	C...	CellName	P..	RSRP	RSRQ	PCC SINR
Serving	9460	31	OPLP02A	340	-113.06	-15.19	0.00
Detected	9460	31	OPLQ78A	277	-116.00	-18.13	
Detected	9460	33	OPLM47C	253	-117.75	-20.25	
Detected	2850	7	OXL217G	312	-128.63	-14.88	

5575.10	814	9.00
3971.06	625	8.50
52880.00	941	6.00
3331.74	648	8.00
50800.00	899	8.50
5574.91	665	8.50

Sheet | Statistic

Confirm with the customer whether the site can be added.

Case2:poor coverage due to Optimization Reason



Type	EA...	C...	CellName	P..	RSRP	RSRQ	PCC SINR
Serving	100	21	OXL3B9V	163	-114.46	-14.08	-0.50
Detected	100	21	OXL3B8V	455	-111.67	-12.79	
Detected	100	19	OXL3A7T	252	-115.29	-15.92	
Detected	100	21	OXLP86V	89	-115.71	-17.54	
Detected	100	19	OXL269T	135	-116.96	-18.29	
Detected	100	19	OXLP54T	280	-117.17	-17.67	
Detected	100	20	OXL268U	487	-119.71	-20.38	

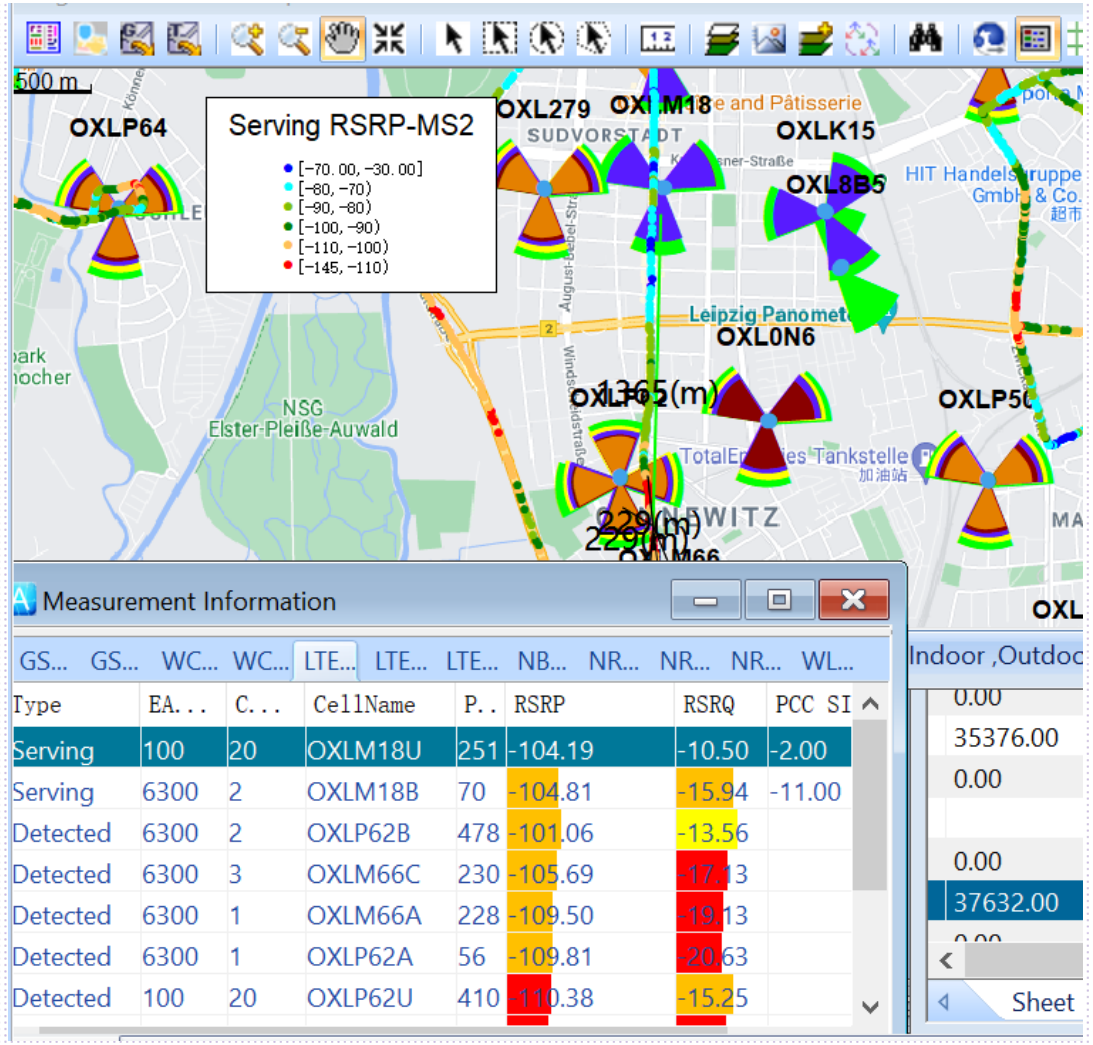
30728.00	997	4.50
33608.00	999	8.00
33328.00	997	5.33
32536.00	1000	5.00
36384.00	1000	5.00
34056.00	999	5.00

Sheet | Statistic

Check the nearest site OXLP54, RF problems or alarm or power and so on

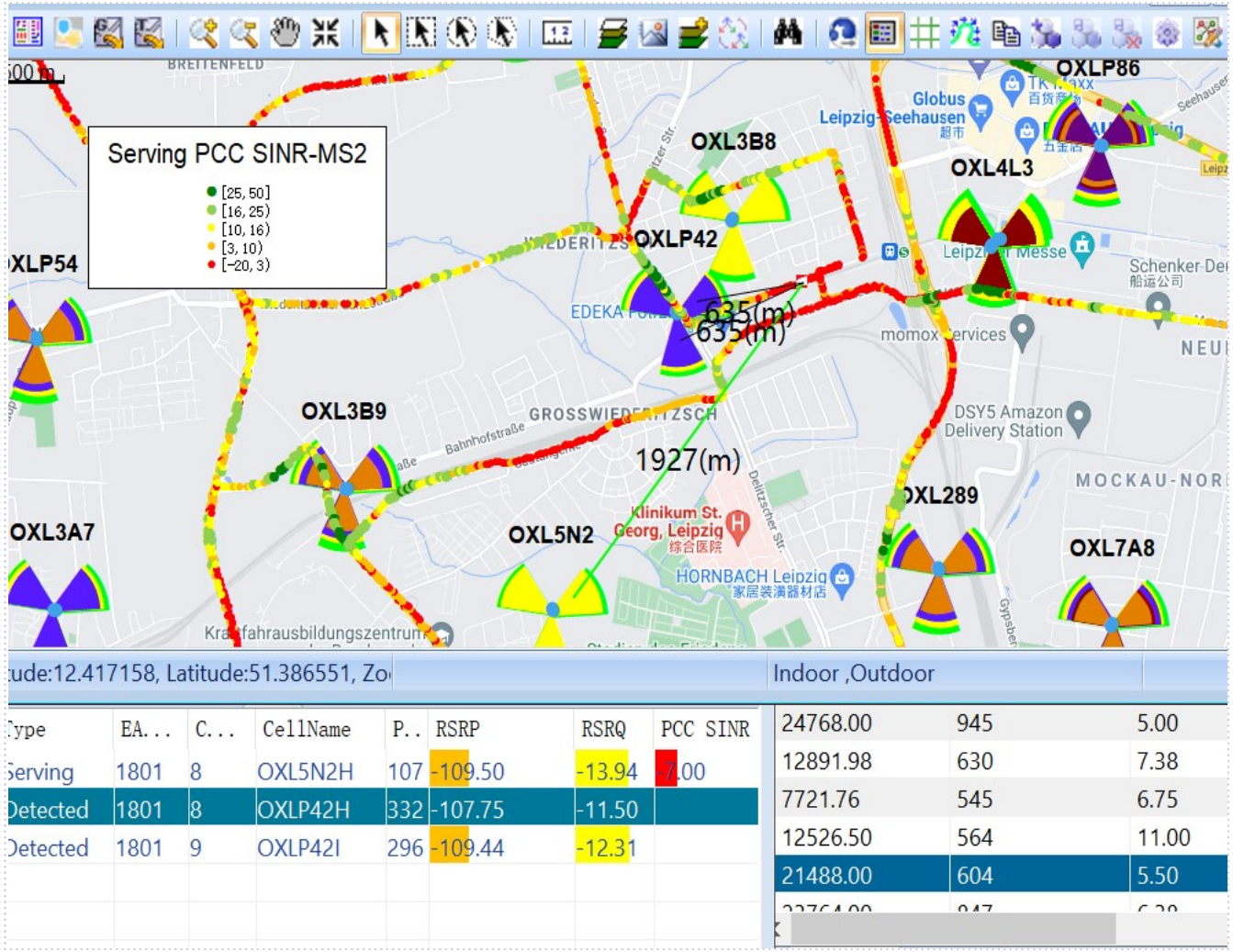
overshoot Coverage Scenario

Case1:Overshoot coverage due to Weak coverage of the main control cell



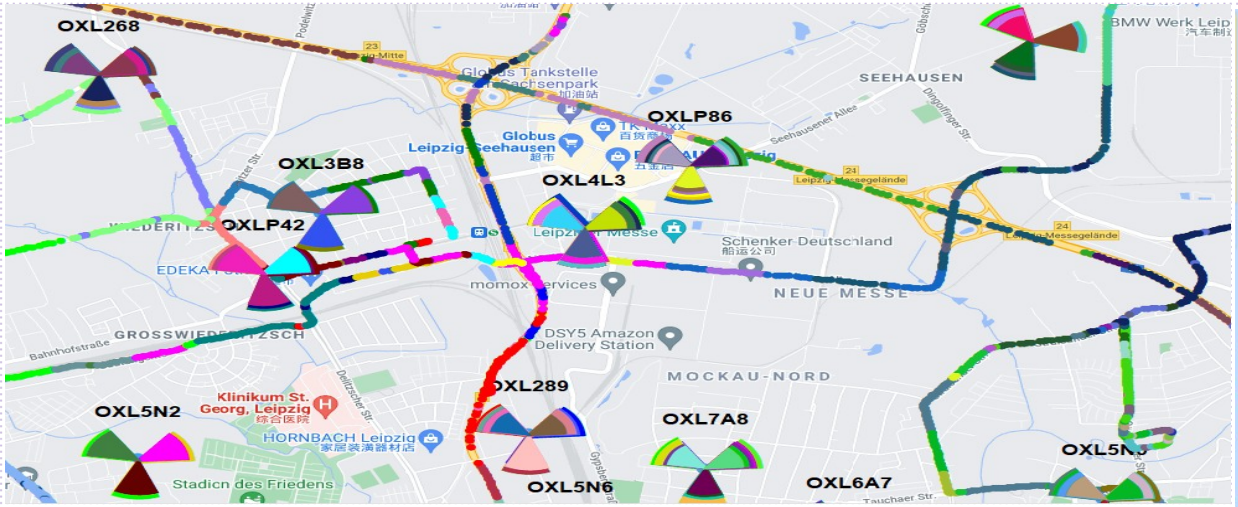
OXLM18U overshoot& main cell OXLPU62 poor coverage , Check the nearest site OXLP54, RF problems \alarms\ power\ho-parameter and so on

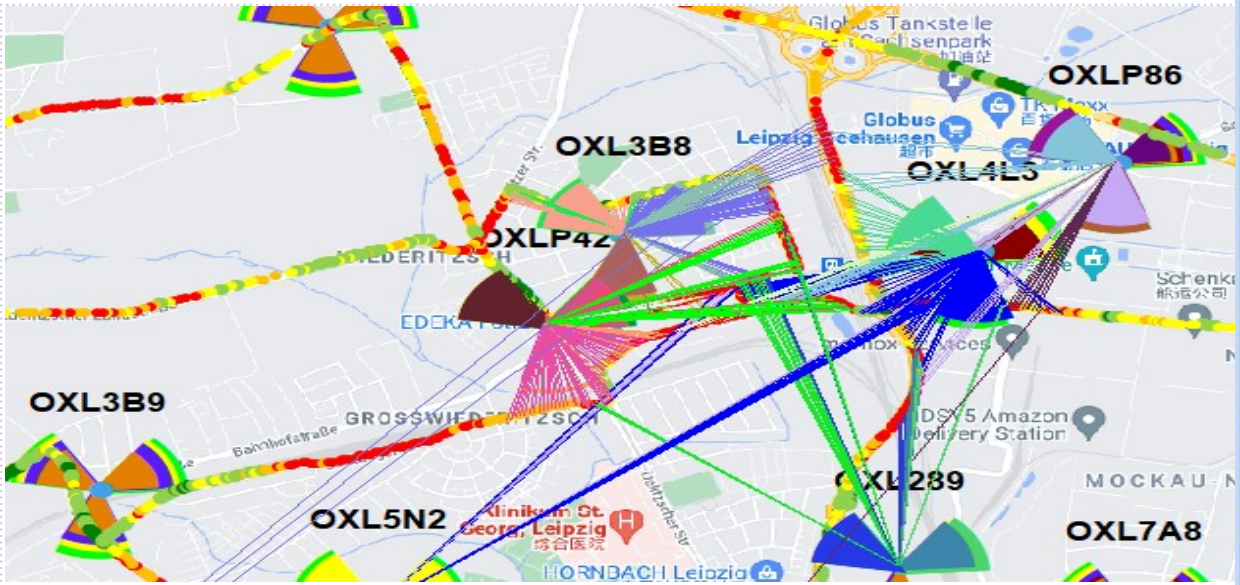
Case2:

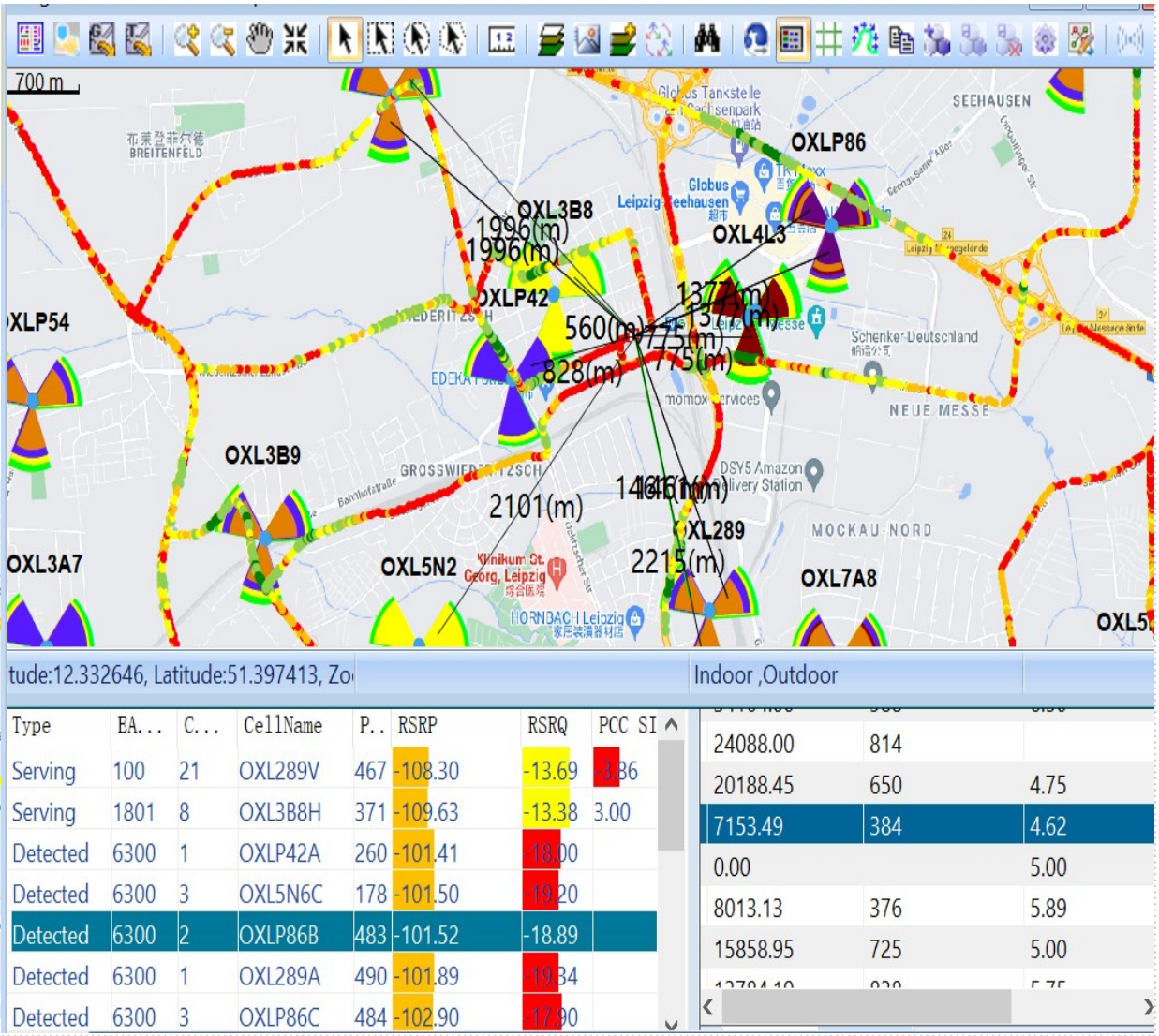


CELL OXL5N2H Overshoot ,should increase the e-tilt of this cell

Overlapping overview







Type	EA...	C...	CellName	P..	RSRP	RSRQ	PCC SI
Serving	100	21	OXL289V	467	-108.30	-13.69	-3.86
Serving	1801	8	OXL3B8H	371	-109.63	-13.38	3.00
Detected	6300	1	OXLP42A	260	-101.41	-18.00	
Detected	6300	3	OXL5N6C	178	-101.50	-19.20	
Detected	6300	2	OXLP86B	483	-101.52	-18.89	
Detected	6300	1	OXL289A	490	-101.89	-19.34	
Detected	6300	3	OXLP86C	484	-102.90	-17.90	

24088.00	814	
20188.45	650	4.75
7153.49	384	4.62
0.00		5.00
8013.13	376	5.89
15858.95	725	5.00

Contents

LTE interference

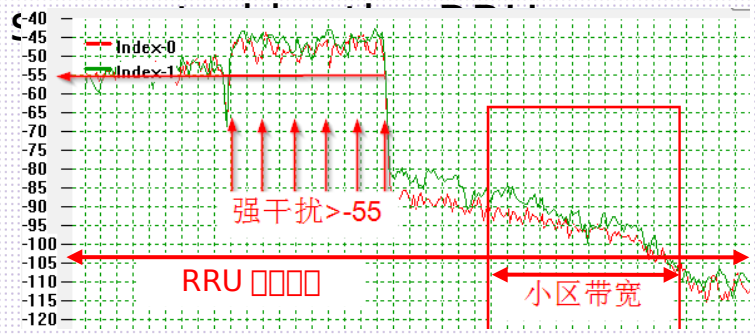
FDD LTE interference types include external interference, intermodulation interference, blocking interference, and neighboring cell interference.

External interference

1. Interference does not match the cell bandwidth.
2. Interference is not related to the traffic volume.

blocking interference:

High-power signals exist in the frequency bands

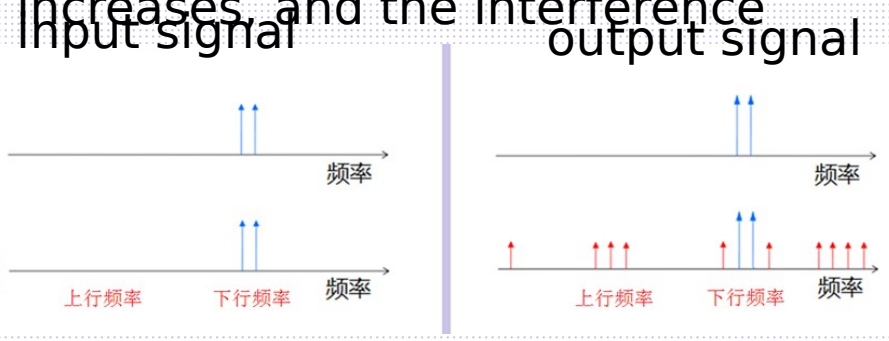


intermodulation interference

1. Co-antenna with other RATCs to form X-order intermodulation or LTE intermodulation.
2. The system power of the interference source increases, and the interference increa

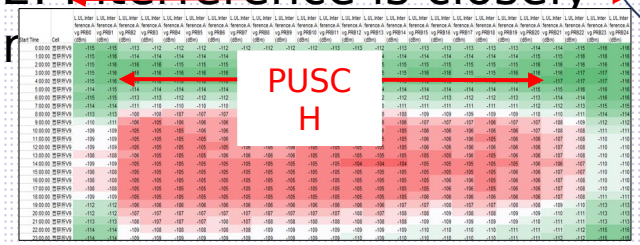
linear system

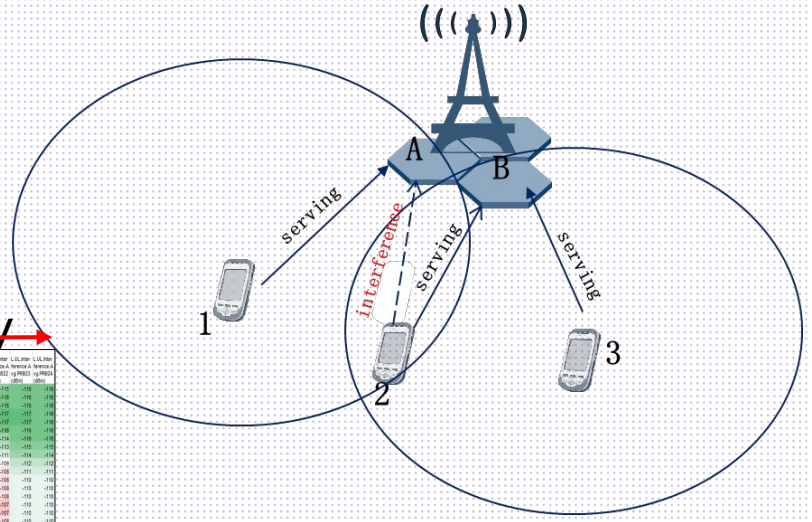
nonlinear system



Neighboring cell interference:

1. Interference has PUSCH/PUCCH characteristics.
2. Interference is closely r

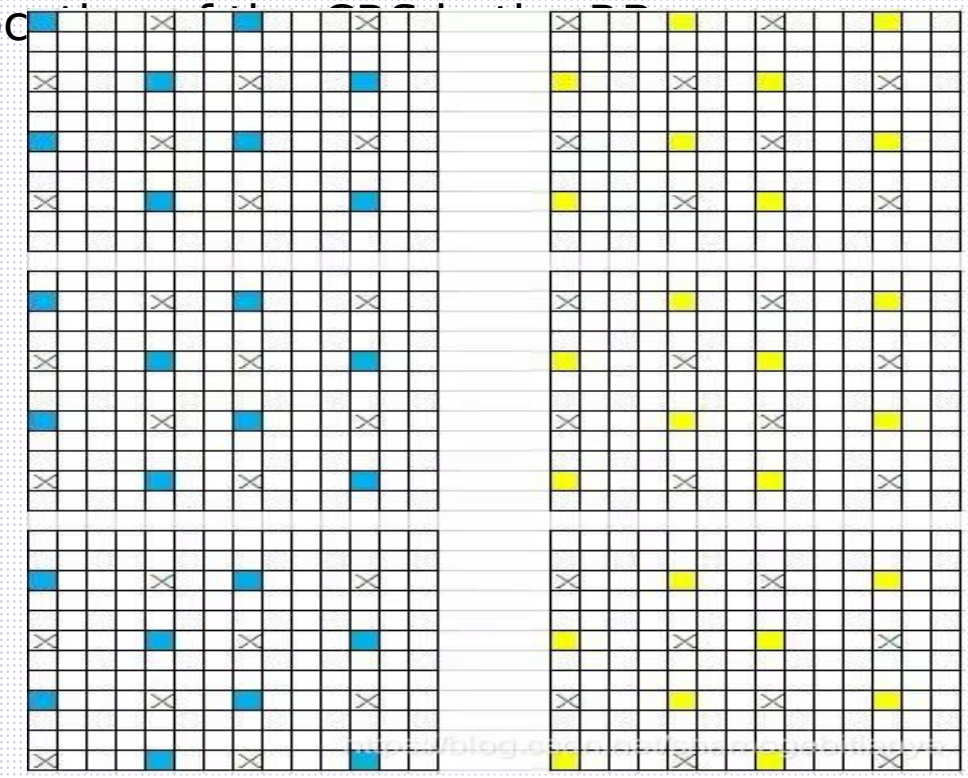




Mod 3 interference

Formation of Modulo 3 Interference

According to 3GPP specifications, each RB has four cell reference signals (CRSs). It is stipulated in frequency domain that there is one CRS in every six subcarriers, and it is stipulated in time domain that the CRS is located in the first symbol and the fifth symbol. Because the LTE system uses dual antennas mostly to transmit and receive data, there are actually three cases for a loc



If CRSs have the same location in the RB, this is called modulo 3 collision, also called modulo 3 interference. There are only three possible positions of the CRS in the RB. Therefore, when signals of four or more cells are transmitted at the same location, a modulo 3 conflict is inevitable.

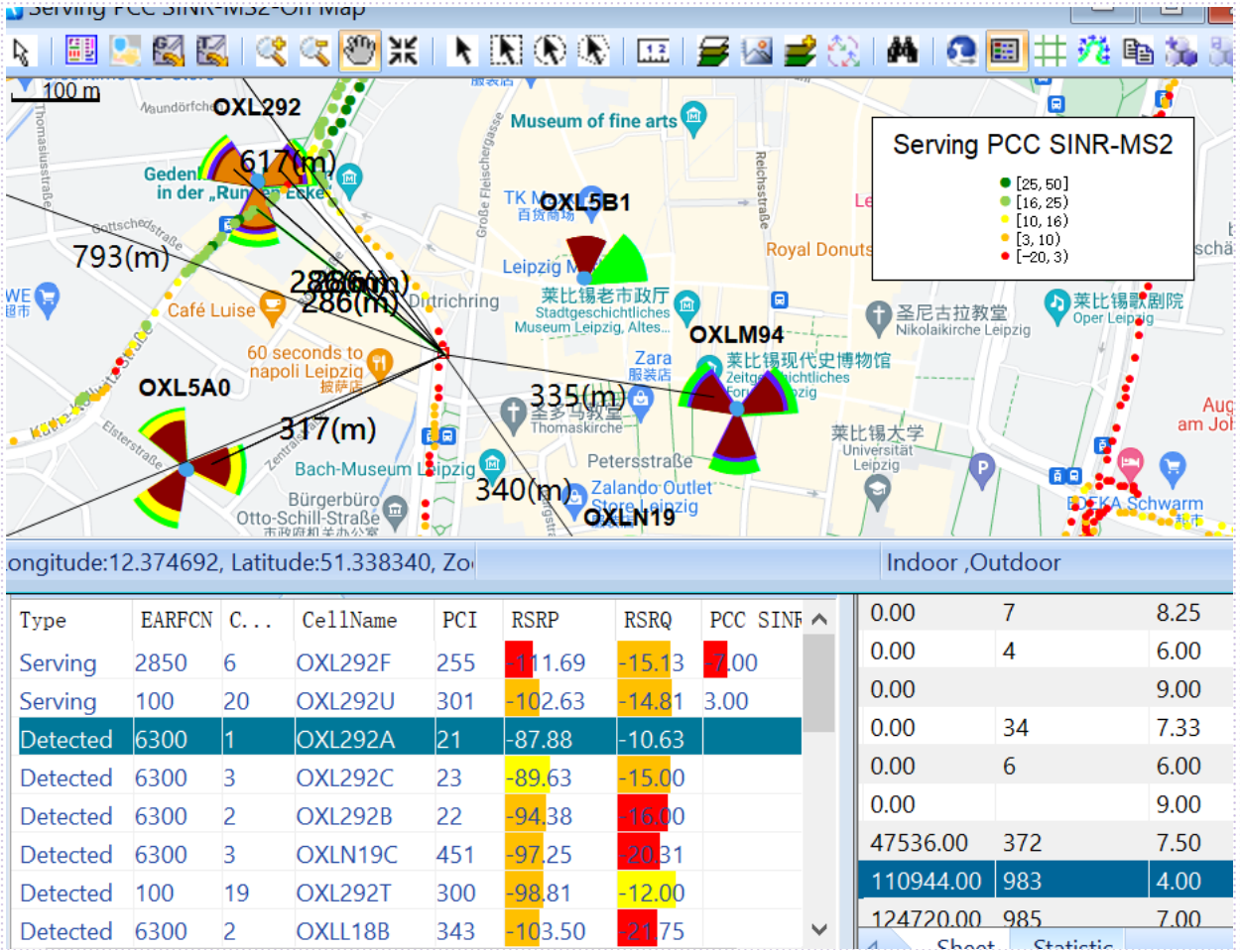
Optimization of Mod 3 Interference

1. Adjust the antenna. adjust the azimuth/tilt to change the coverage area of the interfering cell. On the other hand, adjust the downtilt to reduce the overlapping coverage area of the two cells.
2. Adjust the transmit power of the interfering cell. This reduces the level of the interfering signal, increases the SINR, and optimizes the user rate. This method is most commonly used in live network optimization, but affects the cell coverage capability.

3. Change the PCI of a cell. This is the most critical solution. It can completely resolve the mod-3 interference in a certain area. However, because there are only three possible options for mod-3 interference, changing the PCI usually resolves the mod-3 interference. But modulo-three interference occurs in another place, so this method,

Typical Cases for bad sinr

Case1: coverage



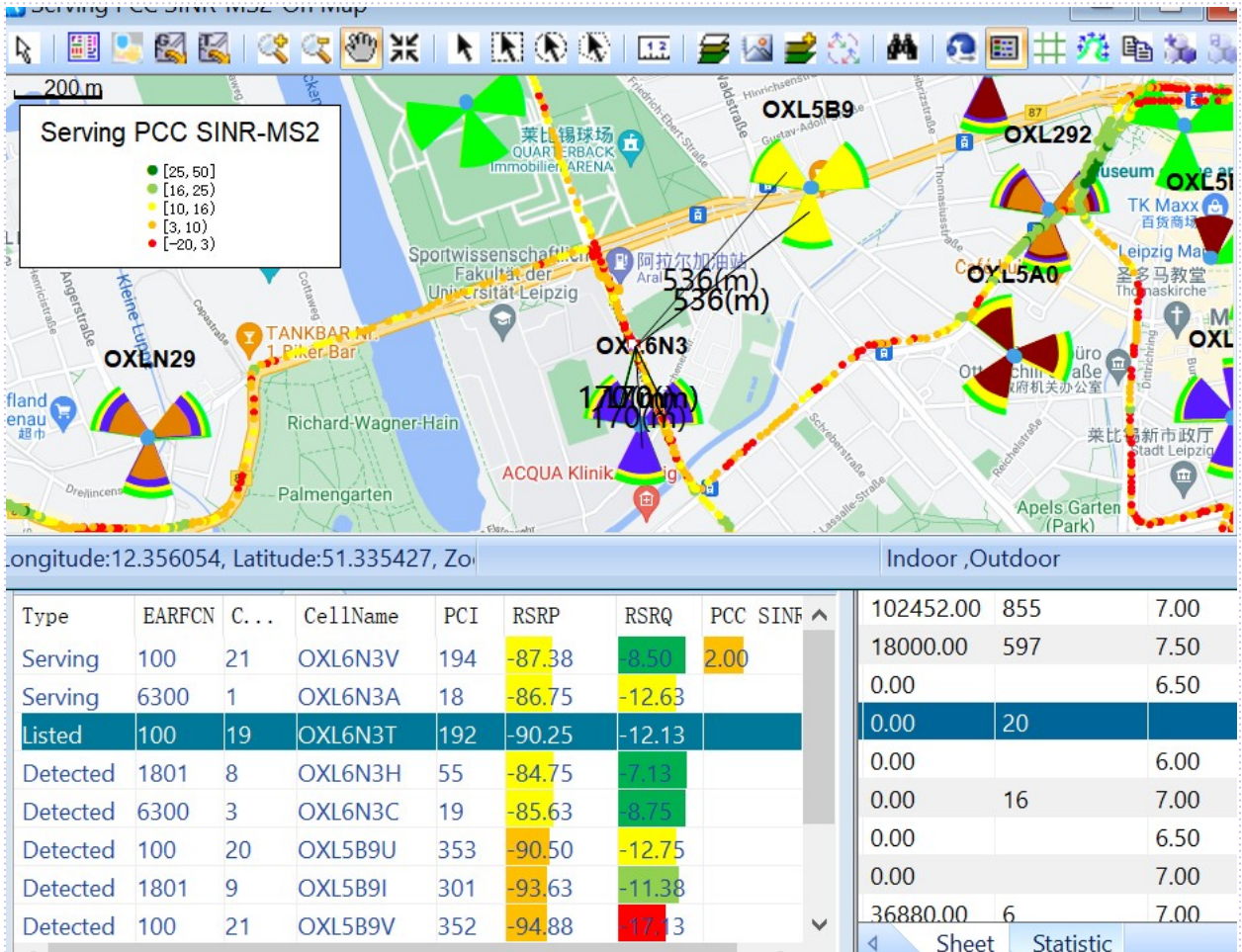
ongitude:12.374692, Latitude:51.338340, Zo | Indoor ,Outdoor

Type	EARFCN	C...	CellName	PCI	RSRP	RSRQ	PCC SINR
Serving	2850	6	OXL292F	255	-111.69	-15.13	-7.00
Serving	100	20	OXL292U	301	-102.63	-14.81	3.00
Detected	6300	1	OXL292A	21	-87.88	-10.63	
Detected	6300	3	OXL292C	23	-89.63	-15.00	
Detected	6300	2	OXL292B	22	-94.38	-16.00	
Detected	6300	3	OXLN19C	451	-97.25	-20.31	
Detected	100	19	OXL292T	300	-98.81	-12.00	
Detected	6300	2	OXLL18B	343	-103.50	-21.75	

0.00	7	8.25
0.00	4	6.00
0.00		9.00
0.00	34	7.33
0.00	6	6.00
0.00		9.00
47536.00	372	7.50
110944.00	983	4.00
124720.00	985	7.00

Sheet | Statistic

Case2: interference



ongitude:12.356054, Latitude:51.335427, Zo | Indoor ,Outdoor

Type	EARFCN	C...	CellName	PCI	RSRP	RSRQ	PCC SINR
Serving	100	21	OXL6N3V	194	-87.38	-8.50	2.00
Serving	6300	1	OXL6N3A	18	-86.75	-12.63	
Listed	100	19	OXL6N3T	192	-90.25	-12.13	
Detected	1801	8	OXL6N3H	55	-84.75	-7.13	
Detected	6300	3	OXL6N3C	19	-85.63	-8.75	
Detected	100	20	OXL5B9U	353	-90.50	-12.75	
Detected	1801	9	OXL5B9I	301	-93.63	-11.38	
Detected	100	21	OXL5B9V	352	-94.88	-17.13	

102452.00	855	7.00
18000.00	597	7.50
0.00		6.50
0.00	20	
0.00		6.00
0.00	16	7.00
0.00		6.50
0.00		7.00
36880.00	6	7.00

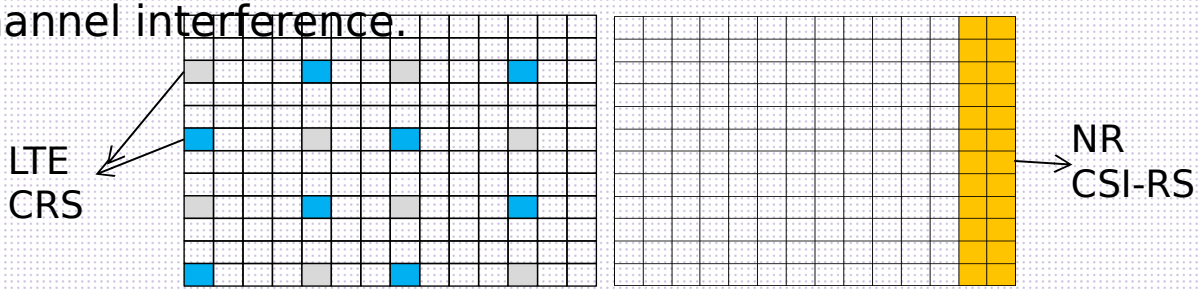
Sheet | Statistic

LTE-NR co-channel interference comparison

Both LTE and NR are OFDM symbols. The subcarrier spacing is similar, the frame length and slot assignment are the same, and the real-time domain and frequency domain are aligned. Co-channel interference between LTE and NR occurs in the following three aspects:

PBCH/SSS/PSS：LTE continuously transmits data on a wide beam. NR supports a maximum of eight narrow beams for polling and randomizing interference.

Reference signal (pilot)：LTE CRSs are continuously sent. However, NR does not have CRSs and uses CSI-RSs. CSI-RSs are sent only when UEs are scheduled. This greatly reduces co-channel interference.



Data subcarrier: LTE and NR transmit data subcarriers only when there is data to be transmitted.

Characteristics of interference between LTE and NR

LTE int

- LTE CRSs are continuously transmitted (about 10% of all REs).
- LTE wide beams and large overlapping areas
- The LTE load is high.

Interference from NR to LTE

- NR CRS Free, no interference to neighboring cells when no load occurs
- NR narrow beam, interference randomization
- NR light load

Contents

Classification of rate-related problems

Wireless side

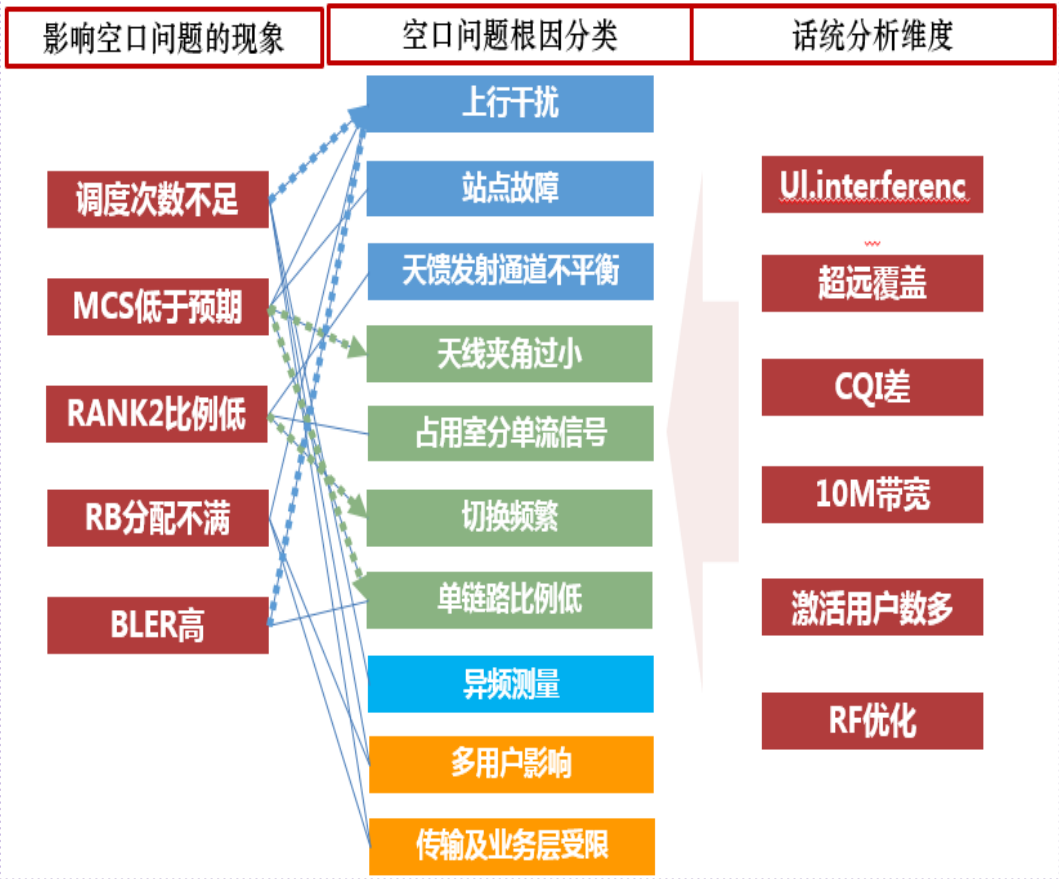
1. Coverage
2. Interference.
3. Neighboring.
4. Grant
5. Prb high load(high prb usage)

Parameters

1. Network camping policy.
2. Ho parameters.
3. Feature parameters.

others

1. Transmission probems: Transmission limited, Transmission Intermittent Disconnection.
2. Core network problems.
3. Terminal problems.
4. FTP service problem
5. Test Method and Process
6. Drving speed



Thank You

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